

EXHIBIT K

1 UNITED STATES PATENT AND TRADEMARK OFFICE

2
3 BEFORE THE PATENT TRIAL AND APPEAL BOARD

4
5 GOOGLE LLC,

6 Petitioner,

7 V.

8 SINGULAR COMPUTING LLC,

9 Patent Owner

10 Case No. IPR2021-00155/Patent No. 10,416,961

11 Case No. IPR2021-00165/Patent No. 9,218,156

12 Case No. IPR2021-00179/Patent No. 8,407,273

13 *****

14 REMOTE VIDEOTAPED / REALTIMED DEPOSITION OF

15 SUNIL P. KHATRI, Ph.D.

16 OCTOBER 21, 2021

17 *****

18
19
20
21
22
23
24
25 Job No. CS4838992

Google Exhibit 1072
Google v. Singular
IPR2021-00165

1 REMOTE VIDEOTAPED / REALTIMED
2 DEPOSITION of SUNIL P. KHATRI, Ph.D.,
3 produced as a witness at the instance of the
4 Petitioner Google LLC, and remotely duly
5 sworn by agreement, was taken in the
6 above-styled and numbered cause on Thursday,
7 the 21st day of October, 2021, from 9:03 a.m.
8 to 2:03 p.m., before Pat English-Arredondo,
9 CSR (TX), RMR, CRR, CLR, CCR (LA), in and for
10 the State of Texas, reported by machine
11 shorthand in remote realtime, with the court
12 reporter located in Houston, Texas, pursuant
13 to the United States Patent and Trademark
14 Office Procedures; that the Witness will read
15 the deposition.

A P P E A R A N C E S

(All via Zoom Video Communications)

COUNSEL FOR PETITIONER GOOGLE LLC:

Ms. Elisabeth H. Hunt (Remote Realtime)

Mr. Anant K. Saraswat

WOLF, GREENFIELD & SACKS, P.C.

600 Atlantic Avenue

Boston, Massachusetts 02210

Phone: 617.646.8000

Elisabeth.Hunt@wolfgreenfield.com

Anant.Saraswat@wolfgreenfield.com

COUNSEL FOR PATENT OWNER SAMSUNG COMPUTING
LLC:

Mr. Richard Cowell (Remote Realtime)

FABRICANT LLP

411 Theodore Fremd Avenue

Suite 206 South

Rye, New York, 10580

Phone: 212-257-5797

rcowell@fabricantllp.com

VIDEOGRAPHER:

Mr. Shawn Budd, Veritext

COURT REPORTER:

Ms. Pat English-Arredondo

CSR (TX), RMR, CRR, CLR, CCR (LA)

I N D E X

PAGE

APPEARANCES..... 3

WITNESS: SUNIL P. KHATRI, Ph.D.

EXAMINATION BY MS. HUNT.....6

EXAMINATION BY MR. COWELL160

CHANGES AND SIGNATURE.....164

REPORTER'S CERTIFICATE.....166

E X H I B I T S I N D E X

(No newly marked exhibits)

(REPORTER'S NOTE: All quotations from exhibits are reflected in the manner in which they were read into the record and do not necessarily denote an exact quote from the document.)

1 (Proceedings commence at 9:03 a.m. CST)

2 THE VIDEOGRAPHER: We are on
3 the record. This is the videographer
4 speaking, Shawn Budd, with Veritext
5 Legal Solutions.

6 Today's date is October 21,
7 2021. The time is 9:03 a.m. We are
8 here to take the remote video
9 deposition of Sunil P. Khatri, Ph.D.,
10 in the matter of Google LLC versus
11 Singular Computing.

12 Would counsel please introduce
13 themselves for the record.

14 MS. HUNT: I am Elisabeth Hunt
15 from Wolf, Greenfield & Sacks. With
16 me is Anant Saraswat, also from Wolf,
17 Greenfield & Sacks. We are
18 representing the petitioner, Google.

19 MR. COWELL: My name is
20 Richard Cowell from Fabricant LLP,
21 representing Singular.

22 THE VIDEOGRAPHER: And would
23 the court reporter please swear in the
24 witness.

25 THE REPORTER: Sir, will you go

1 ahead and raise your right hand to be
2 administered the oath.

3 SUNIL P. KHATRI, Ph.D.,
4 being called as a witness, and having been
5 duly sworn, testified as follows:

6 THE WITNESS: I do.

7 THE REPORTER: Thank you, sir.

8 EXAMINATION

9 BY MS. HUNT:

10 Q. Thank you very much.

11 As you heard, Dr. Khatri, my
12 name is Elisabeth Hunt. I'm counsel for
13 Google, the petitioner.

14 Could you please say and spell
15 your full name for the record.

16 A. Yes. My full name is Sunil P.
17 Khatri. And that is spelled S-U-N-I-L,
18 middle initial is P, and the last name is
19 Khatri, K-H-A-T-R-I.

20 Q. Thank you. And can you hear me
21 all right, when I'm speaking?

22 A. Yes.

23 Q. Now, today's deposition
24 concerns three cases, which are IPR2021-00155
25 regarding the '961 patent; IPR2021-00165

1 there is nothing changed since the morning.
2 The audio and everything is exactly the same
3 as before. I'm -- let me move the computer a
4 little bit and see if that helps.

5 Q. (By Ms. Hunt) I think it's
6 better when your face is facing the camera
7 than when -- than when your face turns the
8 other way.

9 A. Okay. Let me see if I can move
10 like this. I will move the binder like right
11 here so it's in the line of my camera
12 (indicating). Okay.

13 Q. So I don't think the court
14 reporter caught your answer.

15 But the question was just: In
16 Paragraph 55 of your declaration, you discuss
17 a digit-serial multiplication circuit that
18 Tong teaches. Correct?

19 MR. COWELL: Objection to form.

20 A. In Paragraph 55, I talk about,
21 you know, Tong teaching this digit-serial
22 multiplication circuit in the paper.

23 Q. And is Tong's digit-serial
24 multiplication circuit an LPHDR execution
25 unit?

1 MR. COWELL: Objection to form.

2 A. So, you know, Tong's
3 digit-serial multiplication unit actually
4 performs multiplication at various
5 precisions.

6 You know, it can perform 24 bit
7 multiplication and it can perform
8 multiplication at different bit widths.

9 So it's one single circuit that
10 can perform multiple -- multiple bit widths
11 of multiplication, and therefore it is not an
12 LPHDR unit.

13 Q. (By Ms. Hunt) Did you say that
14 because Tong's digit-serial multiplication
15 circuit can perform multiplication at various
16 precisions, it's not an LPHDR unit?

17 A. Yes.

18 MR. COWELL: Objection to form.

19 A. I mean, to answer that
20 question, I would look at my definition of
21 LPHDR units.

22 And, you know, we've talked
23 about my -- the definition, which is
24 basically what a person of ordinary skill in
25 the art would understand the LPHDR unit to

1 mean.

2 And if we applied that test,
3 you know, Tong would fail that test.

4 Q. (By Ms. Hunt) And you're
5 saying Tong would fail that test because
6 there is more than one precision at which
7 Tong's digit-serial multiplication circuit
8 can operate?

9 MR. COWELL: Objection to form.

10 A. Tong fails the test for
11 multiple reasons. We can apply that test,
12 you know, based on my -- on a construction of
13 person of ordinary skill in the art would
14 have for an LPHDR unit.

15 Q. (By Ms. Hunt) So what are the
16 multiple reasons that it fails?

17 A. So let me go back to the -- to
18 the test of the LPHDR, that construction for
19 the LPHDR unit.

20 I'm trying to find that
21 location. Can you help me find the
22 paragraph?

23 Q. I think it's Paragraph 59.

24 A. So in Paragraph 59, you know,
25 the LPHDR, the low precision high dynamic

1 range, execution unit would be defined as an
2 execution unit that executes arithmetic
3 operations only at low precision and with
4 high dynamic range, wherein low precision and
5 high dynamic range are defined according to
6 the numerical requirements below.

7 Now, the Tong digit-serial
8 multiplication unit, if I go back to the
9 reference of Tong -- I think it's on
10 Page 280. Let me see.

11 So it performs -- you know,
12 first of all, it performs -- it can
13 perform -- let's see. Let me find the
14 right -- there we go.

15 If you look at Page 280 towards
16 the bottom of the left-side column, it says
17 that the 24-by-8 bit architecture allows us
18 to perform 8, 16, and 24 bit multiplication
19 bypassing the data once, twice, or thrice
20 through the multiplier.

21 So essentially it's
22 basically -- you know, it's just like
23 variable precision multiplier that is taught
24 by Tong in that it can perform three
25 different precisions of multiplication.

1 Q. Are any of those precisions a
2 precision multiplication?

3 MR. COWELL: Objection to form.

4 A. So, you know, these precisions
5 aren't -- they are 24 bit, and therefore
6 basically that's -- you know, that's much
7 more than the 8 bit precision or 16 bit, but
8 it can go all the way up to 24 bits of
9 precision.

10 Q. (By Ms. Hunt) But to do that,
11 it has to use multiple clock cycles to do the
12 higher precision. Right?

13 MR. COWELL: Objection to form.
14 Outside the scope.

15 A. It uses extra clock cycle and
16 extra control logic as Tong teaches in order
17 to do that.

18 So in other words, it's not
19 a -- you know, it doesn't do one precision
20 but it does multiple of these precisions
21 using control logic that chooses between one
22 of these three selections.

23 Q. So is it the fact that it's
24 doing more than one precision that makes you
25 say that it's not LPHDR?

1 MR. COWELL: Objection to form.

2 A. Can you repeat the question?

3 Q. (By Ms. Hunt) I'm trying to
4 understand, is it -- are you saying it's not
5 LPHDR because it does more than one precision
6 or is it something about the level of
7 precisions that it can do?

8 A. No, so if you --

9 MR. COWELL: Objection to form,
10 outside the scope.

11 A. If you look at the construction
12 of LPHDR, it is an execution that -- sorry --
13 it is an execution unit that executes
14 arithmetic operations only at low precision
15 and at high dynamic range.

16 So it needs to compute, you
17 know -- I mean, it needs to compute
18 arithmetic operations only at low precision.

19 Q. (By Ms. Hunt) And so which of
20 the operations in Tong's digit-serial
21 multiplication circuit are not at low
22 precision?

23 MR. COWELL: Objection to form.
24 Outside the scope.

25 A. So, for example, the 24 bit

1 precision is -- you know, if it uses the
2 mantissa as exponents of -- you know,
3 according to the standard IEEE ratio, it
4 would be, for example, some -- it would be an
5 arithmetic unit that, you know, doesn't
6 execute arithmetic operations only at low
7 precision.

8 24 bit is generally, you know,
9 a very high precision compared to the
10 precisions that we're talking about, you
11 know, for the Singular patents.

12 Q. (By Ms. Hunt) But to the
13 extent Tong's digit-serial multiplication
14 circuit can do a 24 bit multiplication, it's
15 just doing a combination of multiple lower
16 precision multiplications. Right?

17 MR. COWELL: Objection to form.

18 Outside the scope.

19 A. I don't know what that means.
20 It's basically doing 24 bit multiplication.
21 I don't know what combination of lower
22 precisions means.

23 Q. (By Ms. Hunt) You said in
24 Paragraph 55 of your declaration starting
25 four lines up from the bottom of the

1 page -- sorry -- starting at the fifth line
2 up from bottom of the page: "The result of
3 this reduced-precision operation, in which an
4 8-bit operand is multiplied with a 24-bit
5 operand, can be combined with other
6 reduced-precision results over multiple clock
7 cycles in process called "digit-serial
8 multiplication," yielding a full-precision
9 result."

10 Correct?

11 A. Can you point me to where that
12 is? Sorry. You lost me.

13 Q. In your declaration,
14 Paragraph 55 --

15 A. Yes.

16 Q. -- this is the second sentence
17 of Paragraph 55 of your declaration.

18 A. Okay.

19 Q. "The results of this
20 reduced-precision operation, in which an
21 8-bit operand is multiplied with a 24-bit
22 operand, can be combined with other
23 reduced-precision results over multiple clock
24 cycle this a process called "digit-serial
25 multiplication," yielding a full-precision

1 result."

2 A. Yes. I see that.

3 Q. So isn't that actually doing
4 multiple reduced-precision multiplications?

5 A. No, I wouldn't say that.

6 MR. COWELL: Objection to form.

7 A. It's like three different,
8 separate, you know -- it's three different,
9 separate precisions, one of them being a full
10 precision.

11 And that's why -- you know,
12 it's not -- as a consequence, it's not an
13 execution unit that executes arithmetic
14 operations only at low precision with a high
15 dynamic range.

16 MR. COWELL: Form. Go ahead.

17 Q. (By Ms. Hunt) You think that's
18 true because it can do a full-precision
19 multiplication even though that takes
20 multiple clock cycles to do?

21 MR. COWELL: Objection to form.

22 Outside the scope.

23 A. That's just the technique it
24 use, but at the end of the day, it's able to
25 do -- you know, it's able to do full

1 precision as well.

2 So it's able to do three
3 different precisions, as the language on
4 Paragraph 286 -- sorry -- on Page 280 says.

5 It says (as read): "A 24-by-8
6 bit architecture, see Figure 9, allows us to
7 perform 8, 16, and 24 bit multiplication."

8 So it's -- and the way it
9 allows -- the way it does that is by special
10 control logic. So it's a circuit that
11 actually does three different things.

12 Q. (By Ms. Hunt) The one that
13 results in a full-precision result, as you
14 say, makes it not an LPHDR unit?

15 MR. COWELL: Objection to form.

16 Asked and answered. Outside the
17 scope.

18 A. The language of my -- you know,
19 the language in -- in my declaration is
20 clear.

21 It says an execution -- you
22 know, an LPHDR unit is an execution that
23 executes arithmetic operations only at low
24 precision.

25 So if an execution unit

1 operates -- I mean, executes arithmetic
2 operations only at low precision and high
3 dynamic range, then it would be considered an
4 LPHDR unit.

5 It needs to only be low
6 precision and high dynamic range for
7 arithmetic operations.

8 Q. (By Ms. Hunt) Can you look
9 forward to Page 20 of your declaration on the
10 '961 patent, please.

11 A. Okay.

12 Q. And on Page 20 you have a
13 section on "MacMillan."

14 Do you see that?

15 A. Yes.

16 Q. All right. And, again, just in
17 case you need to refer to it, you should have
18 a copy of MacMillan in your binder. It was
19 previously marked Exhibit 1009.

20 (Previously marked was Exhibit
21 No. 1009.)

22 A. I have that in front of me.

23 Q. (By Ms. Hunt) So I would like
24 to still look in your declaration on Page 21.
25 I'm looking at Paragraph 58.

Federal Rules of Civil Procedure

Rule 30

(e) Review By the Witness; Changes.

(1) Review; Statement of Changes. On request by the deponent or a party before the deposition is completed, the deponent must be allowed 30 days after being notified by the officer that the transcript or recording is available in which:

(A) to review the transcript or recording; and

(B) if there are changes in form or substance, to sign a statement listing the changes and the reasons for making them.

(2) Changes Indicated in the Officer's Certificate. The officer must note in the certificate prescribed by Rule 30(f)(1) whether a review was requested and, if so, must attach any changes the deponent makes during the 30-day period.

DISCLAIMER: THE FOREGOING FEDERAL PROCEDURE RULES ARE PROVIDED FOR INFORMATIONAL PURPOSES ONLY.

THE ABOVE RULES ARE CURRENT AS OF APRIL 1, 2019. PLEASE REFER TO THE APPLICABLE FEDERAL RULES OF CIVIL PROCEDURE FOR UP-TO-DATE INFORMATION.

VERITEXT LEGAL SOLUTIONS
COMPANY CERTIFICATE AND DISCLOSURE STATEMENT

Veritext Legal Solutions represents that the foregoing transcript is a true, correct and complete transcript of the colloquies, questions and answers as submitted by the court reporter. Veritext Legal Solutions further represents that the attached exhibits, if any, are true, correct and complete documents as submitted by the court reporter and/or attorneys in relation to this deposition and that the documents were processed in accordance with our litigation support and production standards.

Veritext Legal Solutions is committed to maintaining the confidentiality of client and witness information, in accordance with the regulations promulgated under the Health Insurance Portability and Accountability Act (HIPAA), as amended with respect to protected health information and the Gramm-Leach-Bliley Act, as amended, with respect to Personally Identifiable Information (PII). Physical transcripts and exhibits are managed under strict facility and personnel access controls. Electronic files of documents are stored in encrypted form and are transmitted in an encrypted fashion to authenticated parties who are permitted to access the material. Our data is hosted in a Tier 4 SSAE 16 certified facility.

Veritext Legal Solutions complies with all federal and State regulations with respect to the provision of court reporting services, and maintains its neutrality and independence regardless of relationship or the financial outcome of any litigation. Veritext requires adherence to the foregoing professional and ethical standards from all of its subcontractors in their independent contractor agreements.

Inquiries about Veritext Legal Solutions' confidentiality and security policies and practices should be directed to Veritext's Client Services Associates indicated on the cover of this document or at www.veritext.com.